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ABSTRACT

This document summarizes the conclusions of research papers and participant discussions at a conference on employer-sponsored training in 1988. Following an introduction, the first section offers support for the statement that employers invest heavily in training their best-educated and trained employees. The following are among the conclusions reported: (1) employer-sponsored training accounts for about two-fifths of U.S. investments in human capital; (2) company-sponsored training is complementary to, not a substitute for, investments in academic and problem-solving skills; (3) low income employees are poorly educated and receive little training from employers; (4) nonwhite employees are less likely than white employees to be trained by employers; and (6) women are more likely to enroll in training programs without employer sponsorship and are less likely to receive training from employers. The second section addresses the statement that employer-sponsored training raises employees' wages and improves their employability more than other forms of training. Among the conclusions reported are the following: (1) whether employers over- or underinvest in training is not known; and (2) trained workers are less likely to quit their jobs. The third section supports the statement that slowing work force growth, expanding trade, and accelerating technological advances are changing the nature of work, the skills required, and the level and type of employers' investments in training. The fourth section considers what is involved in the participants' pledge to promote employer-sponsored training, strengthen academic and problem-solving skills, use training institutions more effectively, and rethink the postsecondary education and training system for the disadvantaged. The document concludes with 15 unanswered questions that suggest further research. (CML)

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# EMPLOYER-SPONSORED TRAINING: CURRENT STATUS, FUTURE POSSIBILITIES

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and
Sue E. Berryman

February 1989

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This paper synthesizes the conclusions and policy implications of the six background papers and peer reviews commissioned for the Conference on Employer-sponsored Training. The conference, held in Alexandria, Virginia, on December 1-2, 1988, was sponsored by the Institute on Education and the Economy, Teachers College, Columbia University, New York, New York, and funded by the National Assessment of Vocational Education of the U.S. Department of Education.

Several of the background papers for this conference are based on research conducted for the National Center on Education and Employment, Teachers College, Columbia University, and funded by the Office of Research, Office of Educational Research and Improvement, the U.S. Department of Education.

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## PREFACE AND ACKNOWLEDGEMENTS

This report summarizes the conclusions of research papers and discussions among participants in a conference on employer-sponsored training held in Alexandria, Virginia, on December 1-2, 1988. The conference was organized by the Institute on Education and the Economy, Teachers College, Columbia University, with funding from the National Assessment of Vocation Education of the U.S. Department of Education.

Half of the research papers commissioned for the conference could not have been written if their authors had not received sustained prior support from the Office of Research, of the Office of Educational Research and Improvement, U.S. Department of Education. This support was a five-year grant for the conduct of the National Center on Education and Employment; the National Center is based at the Institute on Education and the Economy.

This overview of the work of the conference is directed toward policymakers concerned with human capital investment issues. Thus, it includes only the most salient findings of the research papers and arguments of the participants; it does not describe the data and methodology employed to generate these findings, nor the caveats that inevitably attach to empirical investigation. Those who require such information will find it readily available in the full papers, which are being published concurrently with this report. Rather than provide an abstract of each paper in turn, this report blends the conclusions of the papers with additional material to summarize what we know about employer-sponsored training, its determinants, and its implications for public policy. This summary was prepared by Dr. Roger J. Vaughan and Dr. Sue E. Berryman in consultation with the authors of the conference papers.

Papers and commentary were prepared by:

Thomas Bailey, Conservation for Human Resources, Columbia University, "Changes in the Nature and Structure of Work: Implications for Employer-Sponsored Training." Commentator, Anthony Pascal, Senior Economist, The RAND Corporation.

Ann P. Bartel, Professor of Economics, Columbia University, "Utilizing Corporate Survey Data to Study Investments in Employee Training and Development." Commentator, Dr. Ronald Ehrenberg, Professor of Economics, Cornell University.

Jacob Mincer, Buttweiser Professor of Economics, Columbia University, "Labor Market Effects of Human Capital and of Its Adjustment to Technological Change." Commentator, Dr. Robert Willis, Director, Economics Research Center, University of Chicago.

Thierry Noyelle, Conservation for Human Resources, Columbia University, "Skills, Skill Formation, Productivity and Competitiveness: A Cross-National Comparison of Banks and Insurance Carriers in Five Advanced Economies." Commentator, David Stern, Professor, School of Education, University of California at Berkeley.

Hong Tan, Economist, RAND Corporation, "Private Sector Training in the United States: Who Gets It and Why." Commentator, Dr. Masanori Hashimoto, Professor of Economics, Ohio State University.

Roger J. Vaughan, Roger Vaughan Associates, "Public Subsidies and Private Training." Commentator, Gary Burtless, Senior Fellow, Brookings Institution.

Other conference participants were: Steven J. Barro, SMB Associates, Washington D.C.; Laurie Bassi, Deputy Director, Commission on Workforce Quality and Labor Market Efficiency, U.S. Department of Labor; Sue E. Berryman, Director, Institute on Education and the Economy, Teachers College, Columbia University; James Brown, Council of Economic Advisors; David Crawford, Executive Director, Council on Workforce Quality and Labor Market Efficiency, U.S. Department of Labor; Michael J. Feuer, Senior Analyst, U.S. Congress, Office of Technology Assessment; Harry Gilman, U.S. Department of Labor; Thomas K. Glennan, Jr, The RAND Corporation, Washington D.C.; David Goodwin, Robert Meyer, Laura Muraskin, and Dorothy Shuler, National Assessment of Vocational Education, U.S. Department of Education; David Myers, Center Director, Decision Resources Corporation, Washington D.C.; Nevzer Stacey, Project Officer, OERI, U.S. Department of Education; and John Wirt, Director, National Assessment of Vocational Education.

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## INTRODUCTION

Employer-sponsored training in the United States is a substantial, but largely invisible, human-capital-producing and wealth-producing system. The distribution of that training, its consequences, the forces coalescing to change it, and its implications for public policy are the story of this paper. As the first section shows, employers invest heavily in training the trainable. In other words, employers refine and build on the verbal, quantitative and problem-solving skills that their employees bring to the labor market from school. Employer training does not now--nor is it ever likely to--substitute for a lack of a sound education before employment.

The second part of this story shows that, with the right raw materials, employer-sponsored training increases productivity, raises wages, and improves the employment stability and work prospects of employees. The combination of education and training allows employers to adapt to rapidly changing technologies so that workforces do not suffer prolonged unemployment. Industries where employment is growing quickly and industries where productivity is rising most rapidly hire better-educated workers, invest more in training their employees, and offer higher wages for skills and experience.

The third section shows how economic development is accelerating our need for well-educated and well-trained workers to cope with new technology and to compete in international markets. However, the nation's demographics--smaller cohorts no better educated than the ones before it--mean that employers cannot rely as heavily as in earlier periods of our history on new entrants to the labor force to meet these needs. They will have to concentrate more on retraining the experienced labor force.

The final part of the story analyzes a number of arguments for using public policy instruments to increase employers' training investments. It comes to three policy conclusions. First: the most powerful public instrument for increasing the level and efficiency of employers' training investments is to improve the quality of the primary and secondary education that workers bring to the labor market. Second: the public sector can improve the articulation between those who need to buy training and post-secondary institutions that deliver training by changing the incentives that now affect these institutions' responsiveness to local employers' and employees' training needs. Third: We need to rethink our post-secondary education and training system for the disadvantaged.

This synthesis is based on papers that analyzed employers' training investments in their workforces. These papers did not examine employers' participation in joint school and corporate educational ventures, such as co-operative learning arrangements with high schools. This exclusion says nothing about these arrangements. Their purposes simply differ from those of employer training investments; the data bases required to assess them differ; and they have different connections to public policy.

In this paper "employer-sponsored training" means training available in or through the auspices of the firm. It does not necessarily mean that the training occurs within the company--training may occur in a college or post-secondary vocational training institution. It does not mean that the employer bears all of the cost of training.[1] In most cases employers and employees share the cost, the employees' cost being paid in the form of wages lower than those they would receive if fully trained.[2]

The confidence that can be placed in the conclusions of this paper depends on the quality of the data used by researchers. Some questions about employer-sponsored training are best answered with analyses of information provided by employers. However, although we have case studies of firms' training investments, our employer surveys of these investments are methodologically flawed, collect limited information, or survey

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[1] In the extreme case, the employer may bear none of the cost. In this case, the employer acts as a proprietary training institution that sells training to those--including employees--who wish to purchase it.

[2] Economic theory predicts that the specificity of the training determines who pays. To the extent that the training is specific, or restricted, to the firm's operations, the employer pays all or most of the cost. To the extent that it creates skills that can be used in companies other than the employer's company, the employee pays a larger share.

only firms of a particular type.[3] Thus, most of our knowledge about corporate training investments--the distribution of training among workers, determinants of these patterns, and their economic consequences--are based on surveys of individuals.[4] The questions on these surveys could be improved,[5] and, even if improved, they cannot yield information that can only be collected at the organizational level. In addition, most of the data reported in the following sections is between six and ten years old--a serious weakness for a decade in which there have been dramatic changes in labor market conditions and therefore, potentially, in employers' levels and patterns of training.

## EMPLOYERS INVEST HEAVILY IN TRAINING THEIR BEST-EDUCATED AND TRAINED EMPLOYEES

> The growing need for ever larger numbers of people with high-level basic skills is clearly one of the dominant pressures on firms to socialize the costs of that investment by shifting its burden onto the formal education system.
>
> Thierry Noyelle, 1988

How much and how well we invest in human capital will shape how fast national income grows, how fast we expand our capacity to produce, and how these benefits of development are shared.

Some employer-sponsored training is little more than an introduction of new employees to their co-workers and a brief description of company policy. In other cases, training may last for several years, involve courses with external institutions, and lead to formal credentials.[6] Often formal training is episodic, as employees are promoted and as new machines or procedures are adopted.[7]

### Employer-Sponsored Training Accounts for About Two-Fifths of the Nation's Investments in Human Capital

Annual investments in employer-sponsored training--both formal and informal or on-the-job--accounts for about 40 percent of our annual human capital investments, totalling about $150 billion (or about 4 percent

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[3] See Ann Bartel for a review of these surveys, in "Utilizing Corporate Survey Data to Study Investments in Employee Training and Development," Paper prepared for the Conference on Employer-Sponsored Training, Alexandria, VA., December 1-2, 1988, sponsored by the Institute on Education and the Economy, Teachers College, Columbia University, and the National Assessment of Vocational Education.

[4] For a discussion of these data bases, see: Hong Tan, "Private Sector Training in the United States," Paper prepared for the Conference on Employer-Sponsored Training, Alexandria, VA., December 1-2, 1988, sponsored by the Institute on Education and the Economy, Teachers College, Columbia University, and the National Assessment of Vocational Education; Jacob Mincer, "Labor Market Effects of Human Capital and its Adjustment to Technological Change," Paper prepared for the Conference on Employer-Sponsored Training, Alexandria, VA., December 1-2, 1988, sponsored by the Institute on Education and the Economy, Teachers College, Columbia University, and the National Assessment of Vocational Education; and Lee Lillard and Hong Tan, *Private Sector Training: Who Gets It and What Are Its Effects?* R-3331-DOL/RC. Santa Monica, CA: The RAND Corporation, 1986, chapter 2.

[5] See the section at the end of this paper on Unanswered Questions.

[6] Our survey data bases tell us the incidence of training and the occupation of those trained, but they do not assess training content nor, in most cases, the length of training.

[7] About one-fifth of the employer spending on training in 1985--$30 billion--was to external training organizations. See Anthony Carnevale, *Employer Investments in Training*, Washington D.C., American Society for Training and Development, 1984.

of GNP) in 1985.[8] These investments were about half as large as investments in plant and equipment. Public investments in primary and secondary education in 1985 were about $170 billion and in post-secondary education and training about $100 billion. It should be noted that cost of wages and salaries are included in the investment estimates, whereas in the case of secondary and post-secondary education, the student's foregone wages are not included in the investment figure. Each year, these investments extend the skills and education of the workforce and add more to national product than our investments in capital equipment.[9]

Training costs are shared between employees--who receive lower wages as trainees and may pay some direct costs--and the employer--who pays the costs of the program and often pays wages to trainees in excess of their productivity.

**Many People Receive Some Training From Their Employers**

Most people need training to get their current job. In 1983, 55 percent of the men and women in the total labor force said that they had needed training for their current job.[10] Employers are a major source for this required training: in 1983, 42 percent of the men and 34 percent of the women in the labor force both needed training to get their current job and got some or all of it in formal company programs or informally on the job. Over a third--38 percent of men and 37 percent of women in 1983--report training to improve their current job skills. Again, employers are a major source of this training: 27 percent of the men and 28 percent of the women in the labor force both got training to improve their job skills and received some or all of it from the employer.[11]

**Company-Sponsored Training is Complementary to, Not a Substitute for, Investments in Academic and Problem-Solving Skills**

Employers train their best-educated employees:[12] only 45 percent of those who failed to complete high school but 71 percent of high school completers and 79 percent of college graduates receive training from their employers (Table 1).[13] Employees who are trained in one job are also more likely than other new employees to be trained in subsequent jobs.[14]

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[8] Carnevale places the range at $66 to $175 billion, *excluding* the cost of employees' foregone earnings. Mincer, op. cit., Table 14, estimates a range of $105 to $210 billion, *including* employees' contributions in the form of lower wages. The 1985 GNP figure comes from the U.S. Congress, Office of Technology Assessment, *Technology and the American Economic Transition: Choices for the Future*, Washington D.C.:Government Printing Office, May 1988.

[9] Edward Denison, *The Experience of Economic Growth: 1929-1980*, Washington D.C., The Brookings Institution, 1986.

[10] These numbers refer to jobs entered since 1959. Thus, the training needed to enter them could have been obtained some years ago or as recently as in the previous month.

[11] Tan, op. cit., Table 2.1. Our estimates of employer-sponsored training for the 1983 workforce are conservative. Employers may have sponsored more of the training that the labor force needed to get their current job or to upgrade their skills on the current job state than we report here. The question about the source of training allowed respondents to check regular school, company training programs, on-the-job training, and "other." Although regular school was an important source, we do not know if employers paid for any of this training and therefore do not include it in our estimates of employer-sponsored training.

[12] Mincer, op. cit.; Lillard and Tan, op. cit.; and Tan, op. cit.

[13] Tan, op. cit., Table 2.8.

[14] Mincer, op.cit.

**Table 1**
**Percent of Employees Receiving Company Training:**
**By Race and Education (1967-1980)**

| | Some Training | 3 or more Programs |
|---|---|---|
| High school Drop-Out | | |
| White | 50.3 | 16.1 |
| Non-white | 39.6 | 5.1 |
| Total | 45.4 | 11.0 |
| High School Graduate | | |
| White | 75.3 | 35.8 |
| Non-white | 56.5 | 22.6 |
| Total | 71.0 | 32.8 |
| Some College | | |
| White | 81.5 | 42.8 |
| Non-white | 76.5 | 27.9 |
| Total | 80.5 | 39.8 |
| College Graduate | | |
| White | 79.0 | 40.3 |
| Non-white | 79.6 | 34.6 |
| Total | 79.1 | 39.7 |

Source: Hong Tan, "Private Sector Training in the United States: Who Gets it and Why," Paper prepared for the Conference on Employer-Sponsored Training, Alexandria, VA., December 1-2, 1988, sponsored by the Institute on Education and the Economy, Teachers College, Columbia University, and the National Assessment of Vocational Education, Table 2.8.

The differences are even more striking for professional and technical training: only 7 percent of employees who did not graduate from high school received this type of training, compared with 27 percent of high school graduates, 44 percent of those with some post-secondary education, and 56 percent of employees who were college graduates.[15]

Employer training, therefore, accentuates differences in educational attainment and achievement among employees--differences that account for most of the differences in income among workers.[16]

[15] Tan, op. cit., Table 2.8.

[16] James P. Smith, The RAND Corporation, personal communication to the authors.

**Low-Income Employees Are Poorly Educated and Receive Little Training from Employers**

Lack of education and training is the single most distinguishing characteristic of the poor.[17] Among economically-disadvantaged people, only 10.9 percent of men and 12.0 percent of women report receiving any post-secondary training relevant to their work. Lacking preparation for the workplace, they are unlikely to be trained by their employers: only 2.6 percent of disadvantaged men and 2.3 percent of disadvantaged women report receiving training from their employers.[18]

While several employers operate special programs for disadvantaged workers, less than one percent of corporate training budgets is devoted to what Xerox chairman David Kearns calls "product recall work for the public school system."[19] People entering the workforce without sound academic and problem-solving skills will find it difficult to remedy their deficiencies on the job.

**Employers Concentrate Training on Craft, Sales, Managerial and Professional/Technical Skills**

The occupations requiring the greatest amount of formal company-sponsored training--either to get the job or to upgrade skills--are the craft, sales, managerial, and professional/technical occupations (Table 2). Training in schools is more important than company training to get managerial, professional, and technical jobs, and, for women, clerical jobs. For professional and technical jobs, school training is also more important than company training for upgrading skills in the job. For craft occupations, company training is more important than school training--both to get a job and to upgrade skills.

**Employers Invest in Younger but Experienced Workers**

Employers invest less in employees during their first five years in the labor market because employers are more apt to lose their investment in employee turnover. Newer entrants to the labor market are more likely to change jobs as they try to match career opportunities with their individual abilities and aspirations. Employers invest less in older workers because they can recapture less of their investment during the employee's shorter remaining work life.

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[17] There are several recent studies. See Robert Friedman, *The Safety Net as Ladder*, Washington, D.C., Council of State Policy and Planning Agencies, 1989.

[18] James Kadamus, *Worker Retraining*, Albany, New York, State Department of Education, June 11, 1985.

[19] Anthony Carnevale, personal communication to Sue E. Berryman, cited in *The Economy and Education: A Diagnostic Review and Implications for the Federal Role*, Paper prepared for the Seminar on the Federal Role in Education, The Aspen Institute, Colorado, July 31-August 10, 1988. See also Thierry Noyelle, *"Skills, Skill Formation, Productivity and Competitiveness: A Cross-National Comparison of Banks and Insurance Carriers in Five Advanced Economies,"* Paper prepared for the Conference on Employer-Sponsored Training, Alexandria, VA., December 1-2, 1988, sponsored by the Institute on Education and the Economy, Teachers College, Columbia University, and the National Assessment of Vocational Education.

**Table 2**
**Percent Employees Receiving**
**Company and School Training to Get Job and Upgrade Skills**
**(by 1-Digit Occupation)***

| Occupation | Training to get Job | | Training to Upgrade Skills | |
|---|---|---|---|---|
| | School | Company | School | Company |
| **MEN** | | | | |
| Administrative/ Managerial | 44.7 | 14.1 | 17.9 | 19.4 |
| Professional/ Technical | 76.0 | 11.5 | 30.5 | 17.3 |
| Sales | 16.7 | 15.0 | 8.8 | 19.4 |
| Clerical | 14.4 | 10.6 | 7.1 | 13.8 |
| Services | 8.3 | 10.7 | 8.0 | 10.9 |
| Craft | 11.0 | 17.0 | 8.1 | 16.2 |
| Machine Operative | 6.7 | 8.4 | 5.2 | 5.4 |
| Transport | 1.3 | 6.2 | 1.6 | 5.3 |
| **WOMEN** | | | | |
| Administrative/ Managerial | 36.7 | 10.6 | 17.6 | 17.9 |
| Professional/ Technical | 74.3 | 9.3 | 35.4 | 16.3 |
| Sales | 7.2 | 8.6 | 4.9 | 10.4 |
| Clerical | 32.2 | 6.0 | 10.8 | 9.5 |
| Services | 7.3 | 7.7 | 5.1 | 5.9 |
| Craft | 7.3 | 9.8 | 5.6 | 8.4 |
| Machine Operative | 1.3 | .1 | .4 | 2.5 |
| Transport | 0.9 | 17.9 | 5.1 | 18.2 |

Source: Hong Tan, op. cit, Table 2.3, from CPS data for 1983.
* For simplicity, this table omits the categories of company on-the-job training and "other" training.

Training of all sorts increases with experience on the current job--although at a decreasing rate--as workers demonstrate their aptitude and commitment to a career or to an employer.[20] Company-sponsored training is more likely to occur later in employees' careers than training in schools (Table 3). Three survey years after leaving school, over half of those employees who received training in outside institutions between 1967 and 1980 had already received it. Less than 40 percent of employees who received company training between 1967 and 1980 had received it within their first three survey years in the workforce. The probability of managerial training is low initially and increases over time, as might be expected if long promotion times are required to attain managerial rank.[21]

[20] Mincer, op. cit.

[21] Tan, op. cit., Table 2.6.

**Table 3**
**Cumulative Probability of Receiving Training**
**(Young Men, 1967-1980)**

| Type of Training | Number of Potential Periods of Work: 1 | 3 | 6 | 9 |
|---|---|---|---|---|
| Any Training | 14% | 40% | 56% | 67% |
| **Source of Training:** | | | | |
| Company Training | 3 | 15 | 28 | 37 |
| School Training | 2 | 11 | 16 | 20 |
| **Occupation Trained:** | | | | |
| Management | 1 | 6 | 10 | 20 |
| Professional/Technical | 2 | 27 | 39 | 47 |
| Semi-Skilled/Manual | 5 | 11 | 21 | 26 |

Source: Hong Tan, op.cit., Table 2.6.

**Non-White Employees Are Less Likely Than White Employees to be Trained by Employers**

Employers trained 38.8 percent of white employees and only 27.2 percent of non-white employees during their first 13 years in the labor force.[22] Racial differences were most marked for more advanced training: 19 percent of whites received managerial training compared with only 8 percent of non-whites, and 44 percent of whites received professional and technical training but only 24 percent of non-whites.[23]

Even when the analysis controls for a very large number of observable worker and industry characteristics, older white male workers are still more likely to receive employer-sponsored training than older black male workers. Although these differences in training probabilities are much smaller among younger black and white male workers, they still exist. Only among black and white career women do we find virtually no difference in the chances of getting employer-sponsored training.[24] These findings for training are compatible with other studies that have found that the earnings gap between black and white male workers--adjusting for educational differences--is closing over time, and for women has closed.[25]

[22] Tan, op.cit., Table 2.7.

[23] Tan, op. cit., Table 2.7.

[24] Tan, op. cit.; Lillard and Tan, op. cit., chapter 3.

[25] See James P. Smith and Finis Welch, *Closing the Gap: Forty Years of Economic Progress for Blacks*, R-3330-DOL, The RAND Corporation, Santa Monica, CA, February 1986.

**Women are More Likely to Enroll in Training Programs without the Benefit of Employer Sponsorship and Less Likely to Receive Training from Employers**

In all occupations (except transportation) women are less likely to receive company training than men, either to get jobs or to upgrade their skills (Table 2), although training differences by sex are more pronounced for getting jobs than for upgrading skills. Women are more likely than men to receive training from schools and colleges rather than from their employers (27.9 percent compared to 22.2 percent). Even well-educated female employees are less likely to have been trained by employers than comparably-educated male employees: female college graduates are only 137 percent more likely than high school graduates to have received additional training on the job, but male college graduates were 148 percent more likely to have received such training.[26]

**Employers in Sectors where Employment is Growing Require Better-Educated Employees**

Financial services, public administration, and professional services--three rapidly growing sectors--employ better-educated workers than agriculture, mining, wholesale trade, and manufacturing--sectors whose share of national employment has been falling or growing more slowly (see Table 4).[27] This pattern reflects, in part, the effects of increased international trade and new technologies. (See Section 3, below.) The overall shift of employment from goods production to services means an increase in the level of education and employer training; except for retail and non-professional services, the service sectors that are growing require more of one or of the other of these forms of human capital.

In-house training by companies is less prevalent in areas with cyclically-sensitive economies.[28] Although large companies will tend to increase training for managerial employees during slack periods--training increases when the opportunity cost of employees' time is low--employee training is not typical countercyclical policy.

**Small Firms Invest Less in Training than Large Firms**

Most studies report that small firms spend less on training than large firms. This may reflect the fact that they are less likely to have a separate personnel department and formal company training procedures and therefore have no easy way of counting. Because employees in small firms must often learn a wider variety of skills, and because small firms usually report hiring slightly less-educated employees than large firms, small firms would appear to have a greater need for training. In view of the importance of new firms--most of which are small--as creators of new jobs (below), policymakers need to know more about their training patterns.

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[26] Tan, op. cit.; and Lillard and Tan, op. cit., p. 29.

[27] Increasing or declining rates of employment growth for a sector (reported in Table 4) say nothing about the economic health of that sector--for example, its profitability or output. They simply say that, relative to some time frame, more or fewer people are employed in the sector. Employment decline can signal an economically troubled industry or sector--for example, steel production, or a sector that has introduced labor-saving technologies--for example, agriculture. Thus, declining employment

[28] A. Bartel and F. Lichtenberg, "The Comparative Advantage of Educated Workers in Implementing New Technology," *Review of Economics and Statistics*, February 1987.

**Table 4**
**Percent Male Employees Trained by Company and Employment Growth Rates 1983-86, By Sector**

| Sector | Percent Employees Needing Training: To Get Job: School Training | To Get Job: Company Training | To Upgrade: School Training | To Upgrade: Company Training | Annual Average Percent Increase in Sector Employment: 1983-1986 |
|---|---|---|---|---|---|
| Agriculture, Forestry, Fisheries | 9 | 1 | 9 | 2 | -2.2 |
| Mining | 16 | 12 | 6 | 19 | -1.5 |
| Construction | 10 | 12 | 8 | 6 | 5.8 |
| Manufacturing (durables) | 21 | 11 | 10 | 14 | 1.7 |
| (non-durables) | 19 | 9 | 8 | 12 | |
| Transport, Communications, Utilities | 13 | 17 | 6 | 21 | 3.1 |
| Wholesale | 17 | 12 | 8 | 17 | 0.8 |
| Retail | 8 | 8 | 4 | 10 | 3.0 |
| Finance, Insurance, Real Estate | 35 | 24 | 17 | 27 | 4.4 |
| Services (professional) | 61 | 8 | 30 | 11 | 2.3 |
| Services (non-professional)* | 20 | 11 | 7 | 8 | 3.5 |
| Public Administration | 35 | 21 | 23 | 32 | 2.7 |

Sources: Hong Tan, op.cit., Table 2.4, and OTA, op.cit., Table 10-13.
* The employment growth rate for non-professional services excludes private household services, which have a negative growth rate of -0.3.

**Summary**

Employer-sponsored training accounts for about two-fifths of the nation's annual investments in workforce education and skills. These investments, in turn, account for more than one-half of the annual growth in national output.

Employer-sponsored training is widespread. Most employers train some of their employees, and, in 1983, over a third of all employees had received from their employers either the formal or on-the-job training necessary for acquiring jobs and for advancing careers. But only employees with sound academic and problem-solving skills are trained by their employers. Those without these skills are not.

## EMPLOYER-SPONSORED TRAINING RAISES EMPLOYEES' WAGES AND IMPROVES THEIR EMPLOYABILITY MORE THAN OTHER FORMS OF TRAINING

> A man who qualifies himself well for his calling never fails of employment.
> Thomas Jefferson, 1811

Training and education increase employees' earnings, make it easier for them to find and keep work, and raise their productivity. And, as the importance of human capital to the economy grows, the earnings differential between employees with and those without education is widening.

The rate of return from education declined during the 1970s as the large and well-educated baby boom entered the labor market. Earnings of college graduates (during their first five years in the labor market) declined from 150 percent of similarly-experienced high school graduates in 1965 to only 130 percent in 1979. But that trend reversed dramatically during the 1980s. By 1986, competition among employers seeking well-educated employees drove up relative earnings of college graduates to 180 percent of those of high school graduates.[29]

### We Do Not Know Whether Employers Over- or Under-Invest in Employee Training

Knowing whether employers invest too much or too little in training their employers is vital for determining the appropriate public policy toward it. The best guide to the appropriateness of employers' investments is the rate of return earned by those investments. The rate of return expresses the increase in productivity of employees as a percent of the initial costs of the training. If returns were high relative to other types of investments--new equipment, expanded plant, larger inventories, for example--we might conclude that employers are under-investing in training, because they could increase output by reducing other investments and investing more in training. If the returns to training were relatively low, employers could gain by investing less in training and expanding other types of investments.

Unfortunately, we cannot measure this rate accurately because we do not have any good measures of the costs of the investments. The largest and most elusive cost element is employees' foregone productivity while engaged in training. Empirical estimates of the average return range from 4 percent to 25 percent.[30] With the data now available, we cannot choose a most likely estimate within this range. Therefore, we are unable, statistically, to identify which firms or industries systematically under-invest in training or which types of employees might profitably be the subject of additional training.

Even if we could accurately identify the *average* rate of return for those who receive company training, the average rate of return does not indicate the benefits--the increased productivity--that would result from *expanding* investments in training. Because human capital is subject to the same diminishing returns to scale that affect all factors of production, increased investments will yield rates of return below the average rates.

### Employer-Sponsored Training Raises Wages and Productivity, and the Effect Endures for Many Years

Company-sponsored training appears to raise earnings more than training in post-secondary institutions.[31] Employers can invest more effectively in their workforces because they know better than post-secondary institutions which types of skills are needed on the job. The more general training offered in the

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[29] The decline during the 1970s was documented by Richard Freeman in *The Overeducated American*, New York, Academic Press, 1976. Recently, Kevin Murphy and Finis Welch have shown the reversal of this pattern in *The Structure of Wages*, Los Angeles, Unicorn Corporation, September 1988; and Kevin Murphy and Finis Welch, "Wage Differentials in the 1980s: The Role of International Trade," Paper presented at the Mont Pelerin Society General Meeting, September 9, 1988.

[30] Mincer, op. cit., Table 13.

[31] Lillard and Tan, op. cit., Table 4.5.

classroom cannot be as "job-specific." Employers also know which employees are best suited for training--they have, in most instances, monitored their performances for several years.

Trainees' wages rise most rapidly during the training period (4-5 percent) but the impact of training on wages endures for over ten years.[32] Training increases wages most for young workers. For those with less than 12 years of work experience, trained workers enjoy wages that at any point in time during the ten years are on average 9.5 percent higher than the wages of untrained workers. For those with more than 12 years of work experience, trained workers receive wages that on average are 3.5 percent higher than the wages of untrained workers.[33] The smaller average wage payoff for more experienced workers probably reflects that older workers already have more skills by virtue of greater job experience, so that training raises their productivity less than that of inexperienced workers.

The productivity of trained workers increases by about twice as much as wages. This indicates that costs--like the benefits--are divided equally between employers and employees.[34]

**Trained Workers Are Less Likely to Quit their Jobs**

Overall, workers who receive training are less likely to leave the company that trained them; workers who move less are more likely to receive training from their employers; and workers who exhibited prior mobility exhibit less mobility once they receive training.[35] Trained workers also change jobs within their company less often than untrained workers.

Training, not job switching, is the quickest way to increase earnings. For the average employee, less than 15 percent of real wage gains over time results from changing jobs; 85 percent comes from being paid more for being more productive.[36]

Young workers, as they seek suitable careers, are equally mobile with or without training. Among younger workers, mobility does not appear to reduce the premium they earn from participating in training--indicating that their company training is valued by other employers. But as young workers acquire training, they become less likely to move.

**Well-Educated and Trained Workers Are Less Likely to be Laid Off and Experience Shorter Unemployment if They Are**

Workers with less than 12 years of schooling are 170 percent more likely to suffer unemployment, and they experience spells of unemployment 30 percent longer than workers with 16 or more years of schooling.[37] Educated workers are more likely to search for a new job while still employed, thus reducing search costs; educated workers acquire and process information more efficiently than less educated workers; and employers and employees both search more intensively to fill more skilled slots.

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[32] Ibid.

[33] This is similar to the estimate of 7.5 percent a year for the first two years of work by J. Barron, D. Black, and M. Loewenstein, "Job Matching and On-The-Job Training," *Working Paper E-97-86*, University of Kentucky, September 1986.

[34] See Barron et al., op. cit., and A. Blakemore and D. Hoffman, "Seniority Rules and Productivity," Draft Paper, Arizona State University, 1988.

[35] Mincer, op. cit.

[36] Ibid.

[37] Jacob Mincer, "Job Training, Wage Growth, and Labor Turnover," *National Bureau of Economic Research Working Paper No. 2690*, 1988.

Training further reduces both the probability of experiencing unemployment and its duration.[18] Controlling for differences in education, people with company training experienced an average of 7.7 weeks of unemployment in 1980, while those with none experienced 9.0 weeks. People with no occupational training--on-the-job or in school--experienced an average of 10.2 weeks. The reduced likelihood of unemployment for those with company training is noticeable for a period of 12 years after training is completed.

**Summary**

Employer-sponsored training produces higher wages, greater increases in productivity, and smaller chances of unemployment than formal classroom training. However, employer training reinforces rather than reduces the differences in educational attainment among new employees. Well-educated people are the most likely to find employment and to receive training from their employers. Once trained, their greater productivity earns them more, they switch jobs less frequently, and they are rarely unemployed. If they change jobs, they find another more easily and are more likely to receive further training from their new employers. Those who start their careers lacking sound academic and problem-solving skills fall further and further behind.

## SLOWING WORKFORCE GROWTH, EXPANDING TRADE, AND ACCELERATING TECHNOLOGICAL ADVANCES ARE CHANGING THE NATURE OF WORK, THE SKILLS REQUIRED FOR WORK, AND THE LEVEL AND TYPE OF EMPLOYERS' INVESTMENTS IN TRAINING

> The nation's ability to compete is threatened by our inadequate investment in our most important resource: people. Put simply, too many workers lack the skills to perform more demanding jobs.
>
> Business Week, September 19, 1988

Our economic environment is changing. Markets are more competitive--in part the result of growing international trade, in part the result of opportunities opened by new technologies, and in part the result of other forces such as government deregulation and rising incomes.

To innovate and to adapt rapidly, employers need employees with better education and better-developed problem-solving and communication skills. However, the supply of new employees is growing more slowly than in the past, and the competence of many high school--and even college--graduates is below that needed in new jobs. Together, these factors can be expected to change the nature and level of employer training investments.

**Falling Numbers of New Workers Will Reduce Employers' Hiring Choices**

Since World War II, employers have met their need for more human capital by replacing each retiring generation of workers from a larger and better-trained generation of workers. But, today, the cohort of new entrants is smaller, and the growth in educational attainment has slowed. The growth rate of the nation's workforce will continue to fall. Fewer new workers means that employers have fewer applicants for each job, making it more difficult to match the increasingly complex demands of jobs with the skills of applicants.

In 1970, the workforce--the number of people working or looking for work--was growing at about 2.5 percent annually, and nearly half the new entrants were white men. About two-thirds of the new workers had graduated from high school or college; about one-sixth were women entering or re-entering the workforce; and about one-sixth were immigrants. Today, the workforce is growing by less than one percent

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[18] Mincer, "Labor Market Effects," op.cit.

annually.[39] White men will make up only 15 percent of the new entrants until the year 2000. White women will make up 42 percent. Non-whites--who constitute 10 percent of today's labor force--will provide 20 percent of the new workers. Immigrants--who make up 7 percent of the nation's workforce today--will provide nearly one-quarter of the new workers.

The U.S. birth rate is falling. The number of women of childbearing age who give birth each year has fallen from 125 out of every thousand in 1960 to only 60 today. As more women fill well-paid jobs, the opportunity cost of child-rearing has risen rapidly. The birth rate today is below the rate of replacement.

As a result, the workforce is aging. Between 1985 and 2000, the population will grow by 15 percent. However, the number of people between the ages of 35 and 47 will grow by 38 percent, while the number between 48 and 53 will grow by 67 percent.[40] The number of 16- to 19-year-olds in the workforce is declining absolutely, and the share of the workforce between the ages of 20 and 34 years is falling. In the future, therefore, *a growing share of the new skills needed in industry will have to be met by retraining existing workers*--yet employers have traditionally preferred to invest in employees whose education is more recent.

**Growth in World Trade Is Making Markets More Competitive**

Because international trade grows when different nations are good at producing different things, its expansion, inevitably, leads nations to specialize; the U.S. produces less of what it can acquire relatively cheaply abroad and increases its production of those goods and services in which it enjoys a comparative advantage. But comparative advantages change when nations develop their capacities to produce and new nations enter the trading arena. These shifts are impossible to predict. Trade, therefore, creates an imperative: adapt quickly or fall behind.

Many of our trade policies have been made implicitly. When we pursue a cleaner environment, we shift relatively "dirty" jobs overseas--steel and mining, for example. New technologies, more portable than older technologies, have made it easier for many countries to industrialize and for companies to operate globally. These changes create economic and political problems. The new jobs in industries competing successfully are not always open to the people losing jobs as a result of increased imports. This creates political pressure for protection. Trade patterns in 1984 show that job loss was concentrated in low- and medium-wage manufacturing, while gains were concentrated in high-wage manufacturing, transportation, and transactional activities, including finance (see Table 5). Trade has displaced jobs requiring little education and created jobs that require higher education and skill levels.

The rapid shifts in trade patterns since 1979 have dramatically increased demands for skilled workers. In 1950, exports totalled about 5 percent of GNP, and imports totalled 4 percent.[41] By 1979, both had reached about 10 percent of GNP. Imports have risen from 99 percent of exports in 1950 to 140 percent in 1979. The share of durable manufactured goods in imports rose from 33 percent to 50 percent. This unprecedented shift has eliminated many well-paid jobs for uneducated workers--particularly among non-white workers.[42] At the same time, new jobs are created in high technology industries and in professional services--jobs that require more extensive formal education. As a result, the rates of return from education have risen sharply.

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[39] The Hudson Institute, *Workforce 2000*, Indianapolis, IN., 1987.

[40] Ibid, p. 79.

[41] OTA, op. cit., p. 283.

[42] Murphy and Welch, "Wage Differentials in the 1980s," op. cit.

**Table 5**
**The Impact of 1984 Trade on U.S. Domestic Employment**

| | Jobs Lost to Imports | Jobs Gained from Exports | Total Jobs in U.S. |
|---|---|---|---|
| Total Jobs (in millions) | 9.3 | 6.5 | 96.9 |
| **Sector** | **Percent of Jobs in Sector: Lost to Imports** | **Gained From Exports** | **Jobs as Percent of Total Jobs** |
| Natural Resources | 8.2% | 8.1% | 3.5% |
| Construction | 3.9 | 2.9 | 4.5 |
| Low-Wage Manufacturing | 16.9 | 5.6 | 4.6 |
| Medium-Wage Manufacturing | 25.9 | 23.7 | 9.6 |
| High-Wage Manufacturing | 1.6 | 15.8 | 5.9 |
| Transportation and Trade | 15.2 | 27.6 | 26.3 |
| Transactions* | 8.7 | 12.9 | 13.0 |
| Personal Services* | 1.5 | 2.1 | 5.5 |
| Social Services | 1.0 | 1.3 | 27.2 |

Source: Office of Technology Assessment, *Technology and the American Economic Transition*, Washington D.C., 1988, p. 291.

* The source for this table defines "transactions" as financial and information services to businesses--in other words, what is commonly meant by the professional service sector. "Personal services" refer to retail and to what is commonly meant by the "service sector"--hotels, beauty parlors, and dry cleaning, for example (p.149).

**Historically, Technological Advances Have Raised the Overall Skill Level of the Workforce and Have Replaced Low-Skill Jobs with Higher-Skill Jobs**

We have feared technology as a destroyer of jobs. In the 1960s, the prospect of computerized production led many to predict reduced employment and "deskilled" jobs.[43] But technology has not reduced overall employment. After a century of unprecedented technological progress, a higher share of the population is employed today and is earning more than at any time in our history. Since 1950, the share of

[43] See the graphic sequences in Fritz Lang's film *Metropolis*, 1929, and the dire predictions of Jacques Elull, *The Technological Society*, New York, Bantam, 1967.

the adult population in the labor force has risen from 60 percent to 66 percent--although male participation has fallen and female participation has risen.[44]

Historically, technological progress has changed the labor market in three ways: it has reduced the number of jobs in goods-producing activities relative to services; it has increased the relative importance of higher-skill occupations within sectors; and it has broadened skill requirements within occupations.

First, technological progress has redistributed employment among sectors--expanding opportunities in services while reducing jobs in manufacturing. In 1950, goods-producing industries (manufacturing, mining, construction and agriculture) employed two out of five Americans. Today, they employ one out of five. Manufacturing's share of national output, however, has remained almost constant at 45 percent.

Second, within sectors, technology is changing the types of occupations employers need--reducing unskilled and semi-skilled positions and increasing the demand for technically trained people. In 1900, about ten percent of the experienced labor force were classified as managers, professions or technicians, and 30 percent worked as farm and non-farm laborers (see Table 6). By 1980, these percents had roughly reversed, about 6 percent working as laborers and 26 percent as professionals, technicians, or managers.

In automobile production today, for example, computer-assisted design and manufacturing has halved the number of production jobs, but, more important, it also halved manual labor's share of those jobs--from 75 percent to 34 percent--while *doubling* the number of technical jobs.[45] The military occupational structure has shown similar shifts. Between 1945 and 1985, white collar enlistees grew from 28 percent to 47 percent of personnel--mostly because technical personnel increased from 13 percent to 29 percent.[46]

Finally, *within* occupations, new technology often demands new competencies--a secretary today must be able to operate complex communications and data processing equipment not invented a decade ago. In the insurance industry, for example, the use of desktop computers has led to the combining of five jobs--messenger, file clerk, customer assistance clerk, claims adjuster, and policy writer--into one job--that of claims adjuster.[47] Overall, there has been no downgrading of skills within low- and middle-level occupations.[48]

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[44] *U.S. Statistical Abstracts*, Washington D.C., U.S. Government Printing Office, various years.

[45] *The Economist*, May 21, 1988, p. 80.

[46] Sue E. Berryman, *Who Serves? The Persistent Myth of the Underclass Army*, London, Westview Press, 1988.

[47] Sue E. Berryman, "Education and the Economy", op. cit.

[48] Thomas Bailey, "Changes in the Nature and Structure of Work: Implications for Employer-Sponsored Training," Paper prepared for the Conference on Employer-Sponsored Training, Alexandria, VA., December 1-2, 1988, sponsored by the Institute on Education and the Economy, Teachers College, Columbia University, and the National Assessment of Vocational Education.

**Table 6**
**During this Century, Technological Progress has Reduced the Number of Laborers and Increased the Number of High Skill Jobs**

**Ratio of Employment by Occupation to Total Experienced Labor Force: 1900 and 1980**

| Occupation | Ratio 1900 | Ratio 1980 |
|---|---|---|
| Professional/Technical | 1:23 | 1:7 |
| Managerial/Proprietors | 1:17 | 1:9 |
| Clerical/Kindred | 1:33 | 1:5 |
| Salesworkers | 1:22 | 1:16 |
| Craftworkers/Supervisors | 1:10 | 1:8 |
| Operatives | 1:8 | 1:7 |
| Non-Farm Laborers | 1:8 | 1:20 |
| Service (including Private Domestic) | 1:11 | 1:7 |
| Farmers/Farm managers | 1:5 | 1:71 |
| Farm laborers | 1:6 | 1:77 |

Sources: For 1900: Series D 182-232, U.S. Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1970.* Bicentennial ed., part 1, 1975, p.139. For 1980: Table 16, U.S. Bureau of Labor Statistics, *Handbook of Labor Statistics.* Bulletin 2175. Washington, D.C.: U.S. Government Printing Office, 1983; and Table A-26, U.S. Bureau of Labor Statistics, *Labor Force Statistics Derived from the Current Population Survey: A Databook, Vol. I.* Bulletin 2096. Washington, D.C.: U.S. Government Printing Office, 1982.

**In Response to Accelerating Technological Change, Employers First Hire Better-Educated Employees and Later Increase In-House Training**

The overall influence of technology on employers' demands for skills masks problems of adjusting to increases in the pace of technological change. Although we do not know how different types of technological advance change employers' behavior, we do know that when innovation speeds the rate of change, employers first hire people with more education,[49] perhaps because people with directly relevant skills are not yet available and because external training institutions have not yet adapted curricula to the new technology.

Education provides general human capital that equips people to cope with change more effectively.[50] New technologies test the training and flexibility of existing workers. More educated workers--particularly those with recent education--appear better able to deal with technical problems as well as with the unstable environment created by rapid technological change.[51] Thus, within occupations, the average educational attainment of employees in high- productivity-growth industries increases.[52]

The manager of a large apparel plant is quoted by Bailey as complaining: "These workers can't do anything they haven't done before, and my equipment is changing too fast to allow me to show them how to do everything."[53] Employers increasingly require higher levels of education before they hire employees to train. For example, commercial banks in Japan, Germany, France and the U.S. sharply upgraded the educational attainment of their new hires between 1976-7 and 1985-6--a German bank, for example, shifted from 85 percent of its new employees with less than twelve years schooling to 85 percent with 12 or more years.[54]

But hiring highly-educated workers is expensive: education provides general skills which command higher wages, even though employers may need only a part of those skills. Therefore, when new technologies become routinized, employers can be more specific in the skills that they hire. At this point firms expand in-house training and hire fewer well-educated, and expensive, workers.

In the early stages of technological innovation in industries, average wages for the less-educated do not grow as fast as for the less-educated in industries with lower productivity growth. For the better-educated, wages grow faster even in the early stages of technological innovation than in industries with lower

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[49] Mincer, "Labor Market Effects of Human Capital," op. cit. A. Bartel and F. Lichtenberg, op. cit., find that the age of the capital stock in an industry is inversely related to the average years of education of its workforce.

[50] See, for example, T. N. Carraher, D. W. Carraher, and A. D. Schliemann, "Mathematics in the Streets and in Schools." *British Journal of Developmental Psychology*, 3 (1), 1985, pp.21-29; Lauren Resnick, "Learning in School and Out," *Educational Researcher*, Vol.16, No.9, December, 1987, pp.13-20; and A. D. Schliemann and N. M. Acioly, "Intuitive Mathematics and Schooling in Understanding a Lottery Game." *Cognition and Instruction* (in press).

[51] Bartel and Lichtenberg, op. cit.

[52] I. Gill, "Technological Change, Education, and Obsolescence of Human Capital," University of Chicago, Paper prepared for National Bureau of Economic Research Summer Institute, 1988.

[53] Bailey, op. cit.

[54] Thierry Noyelle, "Skills, Skill Formation, Productivity and Competitiveness: A Cross-National Comparison of Banks and Insurance Carriers in Five Advanced Economies," Table 2, Paper prepared for the Conference on Employer-Sponsored Training, Alexandria, VA., December 1-2, 1988, sponsored by the Institute on Education and the Economy, Teachers College, Columbia University, and the National Assessment of Vocational Education.

productivity growth. However, as the technology matures and training increases, employers must increase wages to retain trainees. Then wages in high-productivity-growth sectors grow faster than in other industries even for the less educated.[55] The lure of higher wages makes well-educated workers more likely to move to a job in a high-productivity-growth firm when they change jobs.[56]

Despite the rapid pace with which skills become obsolete in high-productivity-growth industries, turnover is lower than in sectors where productivity is growing more slowly--indicating that employees must be acquiring extensive skills specific to the firm as well as skills specific to the technology. This indicates that employers are willing to retrain their employees often and assume a major share of the training costs. Those workers who do quit jobs in high-technology industries are less likely than those in other sectors to experience unemployment, and, if they do, are unemployed more briefly.[57]

The speed with which companies adjust to new technologies and their ability to capture the benefits of increased productivity depend, in part, on labor-management relations within the firm.[58] For most firms, the Office of Technology Assessment concluded: "The potential efficiency gains from new information technology cannot be captured without profound changes in management strategies."[59]

**New Businesses are Creating an Increasing Share of New Jobs**

A hidden consequence of technological change is the decentralization of economic activity. Since computer-based technologies are flexible, firms can produce more diversified and customized products. The economy is moving from department stores to boutiques. Even in manufacturing, some types of craft activities are displacing mass production, and the average size of manufacturing firms is falling.[60]

Today, new businesses can enter markets more easily, and large corporations are able to contract out for more of the specialized products and services they need. For nearly three decades after World War II, economic activity was relatively concentrated. The Fortune 1000 companies employed nearly two-thirds of the workforce and created a comparable share of the new jobs. Today, the Fortune 1000 companies employ only one-third of the workforce and create--at least directly--a much smaller share of new jobs. In the eight years from 1977 to 1985, while real total output grew, real output per firm fell by 20 percent in services, 31 percent in construction, 7 percent in manufacturing, and 58 percent in mining.[61] (Average output per firm increased in only wholesale and retail.) In other words, a larger total output was being generated by firms that on average were smaller.

New firms create most new jobs, although estimates conflict over the relative role of small and new businesses. David S. Birch is the most cited source, but he bases his estimates on Dun and Bradstreet incorporations data that are unreliable for this purpose.[62] Not every incorporation is a new business, for example. Recent studies conducted in rural areas have used unemployment insurance files, which capture all

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[55] Mincer, "Labor Market Effects of Human Capital," op. cit.

[56] Ibid.

[57] Ibid.

[58] For example, some employers treat training as a lifetime commitment and try to retrain existing workers instead of hiring new ones. David Stern, Comments on Paper by Thierry Noyelle, op. cit.

[59] OTA, op. cit., p. 49.

[60] *The Economist*, January 21, 1989, p. 67.

[61] Ibid.

[62] See David Birch, *The American Job Machine*, New York, Basic Books, 1987.

new businesses in which at least one employee is covered by unemployment insurance.[43] These studies have found that people working in businesses created within the past five years account for between 14 percent and 20 percent of all jobs, while total employment growth over the same period was between 10 percent and 12 percent. Without the creation of new businesses, total employment would have fallen.

Three-quarters of the people entering the labor force will find their first job in a company with less than 100 employees. But new businesses are more volatile employers than larger businesses--they are more likely to expand, contract, or even close.[44] People must be able to recycle their skills faster than in the past.

Flexible production activities and the growing importance of self-employment and new business creation are broadening the type of workplace skills needed by new employees. Many of those who acquire occupational skills will also need to know how to operate their own businesses or how to compete as self-employed people if they are to pursue their chosen careers.

**New Jobs Demand Different and Better Generic Skills**

> An insurance company took advantage of the capabilities of desk-top computers to restructure--creating many small teams that work directly with field agents, and each carries out all 167 tasks that used to be performed by three separate departments. Clients' requests can be handled much faster, and new products are developed faster.
>
> Thomas Bailey, op. cit.

Increased international and domestic competition has created strong pressures on all levels of the production process to be more responsive to changes in tastes and demand--to "customized consumption".[45] In both service and manufacturing industries the American economy is moving from a *production*-oriented to a *product*-oriented and *customer*-oriented world, from mass production to flexible production. When production depends on "hard" automation, the retooling required to produce varied output is very costly. Under a "hard" technological regime, the objective is long production runs that drive down per unit cost. Ever since Henry Ford mobilized the labor of low skilled factory workers through the assembly line to replace teams of skilled workers, "hard" technology has almost always been synonymous with the specialization of labor and routinization of jobs.

As technologies become computer-based, they become "flexible" in that retooling simply requires reprogramming, thus allowing shorter production runs and more varied or customized production. Under a flexible production regime, the objective is to combine the customizing implicit in craft production with the cost savings of mass production. Flexibility has usually been achieved by reversing Ford's process: moving back up the range of skill levels, shifting from specialized to general purpose tools and machines, and reorganizing how people get the work done. In other words, the spread of micro-electronics and related

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[43] See Mark Popovich and Terry F. Buss, *Rural Enterprise Development: An Iowa Case Study*, Washington D.C., Council of State Policy and Planning Agencies, 1987; Terry F. Buss and Mark G. Popovich, *Growth from Within: New Businesses and Rural Development in North Dakota*, Council of State Policy and Planning Agencies, 1988; Terry F. Buss, Roger J. Vaughan, and David Gemme, *New Enterprise Development in Michigan's Upper Peninsula*, Northern Michigan University, May 1989; and a study of Maine, forthcoming, by the Council of State Policy and Planning Agencies.

[44] The rising importance of new firms is not limited to the United States. During the 1960s, small firms created less than half the new jobs in Japanese manufacturing. Today, they create all the new jobs. See David S. Birch, "Yankee Doodle Dandy," *INC Magazine*, July 1987.

[45] Thierry Noyelle, *Beyond Industrial Dualism*. Boulder, CO, Westview Press, 1987.

technologies does not just result in new machines that must be mastered, but in a much deeper change in the way production is organized and the ways that workers relate to the production process and to each other.[66]

These economic changes create the demand, not just for new occupationally-specific skills, but also for generic skills that need to be developed by our elementary and secondary schools in *all* students. These include the following.[67]

**Good academic skills.** Perhaps the most profound educational implication of computers in the workplace is that they force a replacement of *observational learning* with *learning acquired primarily through symbols*, whether verbal or mathematical.[68] An example lies in a family of technological systems known as manufacturing resource planning (MRP), which is carrying much of the burden of positioning American industries to compete. Thus, their effective integration into the workplace becomes critical. The MRP is a computer-based integrated information system that coordinates data about all aspects of a company's operations. It uses computer programs organized around functional modules such as inventory management, product control and costing. MRP systems support such manufacturing innovations as "just-in-time" inventory and small-batch customized production. Although initially restricted to large corporations, MRP is now spreading through middle- and small-size firms in all branches of production.

From the perspective of academic skills, what is important about the MRP is that it is a *content-free, formal, closed conceptual system* that workers at all skill levels within the firm have to use. As such, it has many of the characteristics of "school" subjects, such as mathematics or grammar, and departs in significant ways from the traditional systems of knowledge that reflect accumulated managerial and production wisdom.[69],[70]

**Higher-order cognitive thinking.** The shift from mass to flexible production and changes in the time frame for production combine to increase the need for higher-order cognitive thinking,[71] even for jobs that we usually conceive of as lower skill. *Time* has become an important competitive weapon.[72] Companies

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[66] Bailey, op. cit.

[67] Berryman, "Education and the Economy: A Diagnostic Review," op. cit.

[68] See, for example, Sylvia Scribner and Michael Cole, "Cognitive Consequences of Formal and Informal Education." *Science*. Vol.182, November 9, 1973, pp.553-55; and Thomas Bailey, *Education and the Transformation of Markets and Technology in the Textile Industry*, Technical Paper No. 2, National Center on Education and Employment, Teachers College, Columbia University, New York, New York, 1988.

[69] Sylvia Scribner, "Knowledge Acquisition at Work." Research Proposal submitted to the National Center on Education and Employment, 1988.

[70] As the need for symbolically-based learning grows, apprenticeship programs--which have traditionally emphasized workplace experience--have been abandoned in France and redefined in Germany to stress post-secondary classroom work. See Noyelle, *Beyond Industrial Dualism*, op. cit.

[71] Resnick defines higher-order cognitive thinking as: being nonalgorithmic--the path of action is not fully specified in advance; being complex--the total path is not mentally "visible" from any single vantage point; often yielding multiple solutions, each with costs and benefits, rather than unique solutions; involving nuanced judgment and interpretation; requiring the application of multiple, sometimes conflicting, criteria; involving uncertainty--not everything bearing on the task is known; involving self-regulation of the thinking process, not regulation by others; imposing meaning, finding structure in apparent disorder; and being effortful. Lauren Resnick, *Education and Learning to Think*, Washington, D.C., National Academy Press, 1987, p.3.

[72] See George Stalk, "Time--The Next Source of Competitive Advantage." *Harvard Business Review*. July-August, 1988, pp.41-51; and Bailey, "Changes in the Nature and Structure of Work," op. cit.

that can respond to product or service demand quickly gain a competitive edge. If the variation in product and service associated with flexible production multiplies the number of decisions that must be made, the time element makes it difficult to buck these decisions up and back down supervisory lines. Decisions are therefore necessarily having to be made more frequently on the shop floor. Thus, employees in both higher and lower skill jobs are increasingly required to deal with uncertainty, the unfamiliar, and discontinuity. They have to understand the firm's market environment and the organizational context in which the job is embedded. There is a stunning parallel between the cognitive requirements of today's workplace and the defining characteristics of higher-order thinking, and this parallel affects workers in lower as well as higher skill jobs.

**Ability to self-direct.** The forces just described are also flattening out company hierarchies, eliminating supervisory and middle management positions. Supervisory functions are being increasingly delegated to the worker and/or to the team, requiring of previously-supervised workers, not only the ability to make the decisions previously delegated to supervisors, but also the ability to self-regulate or self-direct.

**Knowing how to learn.** The volatility of markets produces a volatility in job tasks--from the job of claims adjuster in the insurance industry to that of operator in the textile mills. These changes imply the need to know how to learn--in other words, how to organize social and technological resources to transform what is unfamiliar into the mastered. This process requires knowing how to identify the limits of one's own knowledge, how to ask germane questions, how to penetrate poor documentation, and how to identify sources of information. As Noyelle observes, "We are moving into an era in which the traditional separation between working and learning is disappearing, with learning becoming increasingly integrated into a person's work life."[73]

**Teamwork abilities.** Under mass production, employees, especially those in factory floor and "back office" jobs, often worked alone, albeit in physical proximity to each other. As job responsibilities broaden and increasingly intermesh, workers have to function collaboratively--and classic research in social psychology shows that individual competence does not generalize to team competence. For example, pilot error accounts for an increasing percent of fatal airline crashes worldwide, and many analyses have pinpointed poor team performance as an important component of that error.[74]

**Conflict resolution skills.** As the labor force becomes increasingly multicultural and job content changes rapidly and in confusing ways, communication problems also increase between workers, generating the need for interpersonal communication and conflict resolution skills. These problems self-evidently reduce productivity; more subtly, they interfere with an important social mechanism for learning on the job--peer help.[75]

**Summary**

Demographic changes mean that a growing share of the new skills needed in industry will have to be met by retraining existing workers. Since employers have traditionally met their increased needs for human capital by hiring recently educated individuals, this demographic change challenges employers' training strategies.

The rapid penetration of domestic markets by foreign competitors has accelerated the pace of economic change in the American economy. Employers have to react faster in developing new products, in reducing costs, and in finding new markets. Trade creates an imperative: adapt quickly or fall behind.

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[73] Noyelle, *Beyond Industrial Dualism*, op. cit., p.121.

[74] William Stockton, "Trouble in the Cockpit," *New York Times Magazine*, March 27, 1988, pp.38-40, 60, 63, 66-67.

[75] Sylvia Scribner, personal communication to the authors.

Trade has eliminated many well-paid jobs for uneducated workers and created jobs that require higher education and skill levels. As a result, the rates of return from education have risen sharply.

Historically, technological progress has changed the labor market in three ways: it has reduced the number of jobs in goods-producing activities relative to services; it has increased the relative importance of higher-skill occupations within sectors; and it has broadened skill requirements within occupations.

In response to technological innovation, employers first hire people with more education: education provides general human capital that equips people to cope with change more effectively. As new technologies become routinized, firms expand in-house training and hire fewer well-educated, and expensive, workers. In the early stages of technological innovation in industries, wages grow faster in these than in lower-productivity-growth industries for the better-educated, but not for the less-educated. However, as the technology matures, training increases, employers increase wages to retain trainees, and wages in high-productivity-growth sectors grow faster than in lower-productivity-growth industries even for the less educated.

American industry is decentralizing--a growing share of new jobs are being created in new small firms which invest less in employee training than larger firms. New businesses are also more volatile employers than larger businesses--they are more likely to expand, contract, or even close. People must be able to recycle their skills faster than in the past.

Increased trade, rapid technological innovation, and a decentralizing economy mean that all workers need strong academic skills, higher-order cognitive thinking skills, strategies for learning, the ability to self-regulate, teamwork skills, and conflict resolution skills.

The growing demand for skills, employers' reliance on well-educated workers to integrate new technologies into the firm, and the country's demography raise the prospect that economic growth will be constrained by a lack of well-educated and trained employees. More ominously, a dual labor market is evolving. The market for unskilled labor offers shrinking opportunities and rising poverty, while the market for human capital promises rising incomes and expanding choices. The challenge to the education system is to increase the human capital of all of its clients, but especially of those outside of the economic mainstream.

## TO PROMOTE EMPLOYER-SPONSORED TRAINING, STRENGTHEN ACADEMIC AND PROBLEM-SOLVING SKILLS, USE TRAINING INSTITUTIONS MORE EFFECTIVELY, AND RETHINK OUR POST-SECONDARY EDUCATION AND TRAINING SYSTEM FOR THE DISADVANTAGED

> I am inclined to think that the corporation that is not in the business of human development may not be in any business. At least, not for long.
>
> William S. Vaughn, Chairman, Eastman Kodak, 1973

Human capital investment, until recently, has played a small part in economic development policy. With growing acknowledgement of the economic importance of education, all aspects of federal and state education policy are being re-examined. How do state and federal policies and programs currently treat employer-sponsored training? And what should be the public policy toward employer-training?

### Current Federal and State Tax Codes and Vocational Programs Already Subsidize Employer-Provided Training

Overall, federal and state tax policies treat employers' investments in human capital more favorably than comparable investments in plant and equipment. First, and most important, much of the costs of training investments can be expensed (written off when they are incurred), while investments in plant and equipment must be depreciated (written-off over time). The financial benefits of expensing relative to depreciation are measured by interest rates.

Expensing employer-provided training investments is valuable--it subsidizes training by about 33 percent relative to longer-term investments.[70] Expensing cannot be avoided because a large part of training costs are wages paid while employees learn. These "training" wages cannot be separated from other wages (which are expensed) for tax purposes. Estimates of the total value of this subsidy range between $13.2 billion and $58.3 billion annually, depending on estimates of employer-sponsored training expenditures.[71]

One-third of employer-trained workers are enrolled in external, post-secondary education or training institutions. The fees employers pay for most of these trainees are much less than the full cost of the training. There are no data on the true costs of public programs (public agencies rarely include depreciation, for example) to compare with the revenues received for customized training programs.

**Public Benefits from Employer-Sponsored Training--Beyond Those Enjoyed by Employer and Employee--Are Hard to Demonstrate**

The case for further public support for employer training rests on finding some public benefit associated with employer-provided training that either the employee and the employer are unable to capture or about which they are systematically unaware. Five arguments are often offered to support additional public subsidy.

**1. The U.S. saves and invests too little.** Economists are concerned by the observation that the United States saves and invests a much smaller share of national income than other developed countries.[72] But if this is true, the U.S. invests too little in all assets--not merely in human capital acquired on the job. The appropriate policy would be to subsidize savings or all "productive" investments--not one asset already heavily subsidized.

**2. U.S. employers under-invest in their workers.** Comparisons of the U.S. and Japan for a selected set of manufacturing industries show that Japanese firms invest more in training and enjoy higher rates of productivity growth.[73] Such relationships have often been interpreted to mean that U.S. employers should invest more in training their employees. There are several problems with this conclusion.

First, the range of estimates of the average rates of return from employer training--reported above--are too broad to lend strong support to the assertion that American employers systematically under-invest. Second, in the Japanese case, the results may be limited to the manufacturing sector--for example, the

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[70] Roger Vaughan, "Public Subsidies and Private Training," Paper prepared for the Conference on Employer-Sponsored Training, Alexandria, VA., December 1-2, 1988, sponsored by the Institute on Education and the Economy, Teachers College, Columbia University, and the National Assessment of Vocational Education.

[71] Neutral depreciation would allow companies to deduct, in the first year, the present value of future depreciation provisions. See Alan J. Auerbach, "Tax Integration and the 'New View' of the Corporate Income Tax: A 1980s Perspective," *Proceedings of the Seventy-fourth Annual Conference on Taxation*, Columbus Ohio, National Tax Association, 1982.

[72] The literature is vast. Some of the more influential books from both ends of the political spectrum include: The Business Week Team, *The Reindustrialization of America*, New York, McGraw Hill, 1981; Lester Thurow, *The Zero Sum Society*, New York, Basic Books, 1980; Ira Magaziner and Robert Reich, *Minding America's Business*, New York, Harcourt, Brace Jovanovich, 1982; Barry Bluestone and Bennet Harrison, *The Deindustrialization of America*, New York, Basic Books, 1982; Chalmers Johnson, ed., *The Industrial Policy Debate*, San Francisco, Institute for Contemporary Studies, 1984; and Richard B. McKenzie, *The Great American Job Machine*, New York, Universe Books, 1988.

[73] Jacob Mincer and Yoshio Higuchi, "Wage Structures and Labor Turnover in the United States and Japan," *Journal of the Japanese and International Economies*, Vol. 2, pp. 97-133, 1988.

banking and insurance industry in Japan does not conform to this pattern.[10] They may be the result of the lower share of new workers in Japan who have received post-secondary education. Most important, they may be the result as well as the cause of the higher rate of growth on Japan. In other words, an association between higher rates of training and higher rates of economic growth does not necessarily imply that increasing training will increase economic growth. *Training must be connected to new economic opportunities to yield productivity and economic growth payoffs.* These new economic opportunities may be new technologies, a re-organization of work within the company to increase its efficiency, new markets, or new products. Training in the absence of new economic opportunities will have no economic impact; the basic challenge lies in creating these opportunities.

**3. People are mobile.** Employers will not train workers if they cannot recapture their investment. But employers use many different types of implicit and explicit contracts to recapture their investments. They usually pay higher wages to trained workers to retain them, they may require employees who quit to repay part of the costs of training; they may require employees to pay part of the training costs directly; and they may offer bonuses to trainees who stay on. The lower mobility rates for employer-trained workers (above) show that these measures succeed.

**4. Employers need incentives to hire and train the disadvantaged.**[11] Public training programs have not solved the problems of most of the hard-to-employ.[12] Therefore, employers have been offered tax incentives and wage subsidies to hire and train economically-disadvantaged people. But trying to get employers to remedy academic skill deficiencies runs counter to their usual grounds for training. Employers are more likely to train firm-specific skills--in other words, skills that employees usually do not bring to the firm and that have limited use outside of the firm. Academic and problem-solving skills, on the other hand, are general human capital skills--they are transportable to other firms.

**5. Training achieves broad social objectives.** Public funding of education has been supported on the grounds that education serves broad social as well as economic objectives. But the same arguments cannot be made for employer-provided training, because it is neither compulsory nor universal. Further subsidies would increase rather than reduce inequality since those trained by employers are already relatively well-educated.

Even if strong evidence for under- or mis-investment were uncovered and policymakers wanted to subsidize employers' investments, it would be difficult to direct those subsidies effectively. Because a large part of training expenditures cannot be separated from regular wages, public agencies could not determine whether individual employers were under-, over-, or mis-investing. Only employers know overall labor market conditions, the market for their goods or services, and the potential benefits of new technologies from which to judge the potential benefits from additional investments in training. And to the extent that they do not know, the market will provide a more efficient corrective to their training investment mistakes than public policy. Employers who consistently under- or mis-invest will eventually succumb to the superior productivity and flexibility of competitors who make better training investments.

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[10] Noyelle, "Skills, Skill Formation, Productivity, and Competitiveness," op. cit.

[11] More than half the welfare population and three-quarters of the long-term poor have not graduated from high school. See Friedman, op. cit.

[12] For example, see Sar A. Levitan and Frank Gallo, *A Second Chance: Training for Jobs*, Kalamazoo, MI, W.E. Upjohn, 1988 ("Short-sighted policies have led JTPA into a blind alley"); James Bovard, "The Failure of Federal Job Training," Cato Institute Analysis, Washington D.C., 1986 ("Federal job training programs have harmed the careers of millions of Americans"); Nancy Dickinson, "Which Welfare-Work Strategies Work?" *Social Work*, Vol. 31, July-August 1986.

**The Most Effective Ways to Encourage Employers to Invest More Heavily in their Workforce Are: I. Improve the Verbal, Quantitative, and Problem-Solving Skills of High School Students; II. Remove Administrative Barriers to Innovation in Post-Secondary Training Institutions, and III. Rethink our Post-Secondary Educational and Training System for the Disadvantaged.**

**I. Improve the Verbal, Quantitative, and Problem Solving Skills of High School Students.** The primary and secondary education system is the central arena for solving workforce problems. Public policy must reflect this fundamental and inescapable fact.

Because employer-sponsored training builds upon rather than fills in for skills learned in school, the best way to encourage employers to invest more in training is to insure that those who leave school possess stronger verbal, quantitative and problem-solving skills.

**II. Reduce Administrative Barriers to Innovation in Post-Secondary Training Institutions.** Public post-secondary training institutions already provide a large share of employer training,[83] and demographic and economic changes indicate that public and private post-secondary institutions will become still more important players in the training game. Rapid changes in job content increase training needs, and the demographic projections indicate that employers will have to meet new human capital needs more by retraining the experienced labor force than by hiring newly school-trained recent graduates. For many skills, formal classroom training is the more efficient approach. The fact that employer-sponsored training generates higher wage returns than school-based training indicates that classroom training tailored to employer needs is the most efficient approach. (Questions about how much taxpayers should subsidize programs structured to meet employers' training needs are another issue.)

Some states have excellent post-secondary training systems, in that they adjust rapidly to changes in training demands. Other states have stagnant systems. One difference between states with responsive and those with un-responsive systems seems to be the discretionary power that states allow their post-secondary institutions. States should give fiscal and administrative incentives to their post-secondary institutions to respond to human capital changes in the economy. For example:

- Educational institutions should be rewarded for serving local employers better. They should, for example, be able to retain the proceeds from fees charged employers for customized training. This would encourage them to market their training services more aggressively.[84]

- Vocational education institutions should be more directly involved in customized training programs that are now operated by states--for the most part, by state departments of economic development.[85]

- The governance of state vocational education systems should give local institutions greater discretionary power. For example, budgets should not be limited to line items but should allow institutions flexibility in hiring staff, purchasing equipment, and marketing programs. They should also be able to carry over resources from year to year. Institutions should be judged on how well they train and place their students and be given greater freedom in experimenting with the best way to achieve these goals.

These incentives should be connected in some way to multi-dimensional measures of institutional and student performance.

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[83] Carnevale (op. cit.) estimates that employers spent between $15 and $20 billion for public and private education and training programs.

[84] In Louisiana, for example, the proceeds revert to the state. See Gulf South Research Institute, Post-Secondary Vocational Education in Louisiana, Baton Rouge, LA, May 1987.

[85] Roger J. Vaughan, Robert Pollard, and Barbara Dyer, Wealth of States, Washington D.C., Council of State Policy and Planning Agencies, 1986.

**III. Rethink our post-secondary educational and training system for the disadvantaged.** There is a final issue. Under the present training system, those who graduate from high school with sound skills add to their stock of human capital by their own efforts and through the investments of their employers. Those who do not start the labor market race with good skills fall further and further behind. For the most part, employers will not remedy their deficiencies. Special training programs for the disadvantaged, such as the Job Training Partnership Act (JTPA), have also not provided in-depth training in fundamental skills for many of the disadvantaged[16]. These programs are often organized to give students the minimal skills required to achieve the minimum placement. This strategy looks increasingly penny-wise and pound-foolish. Disadvantaged graduates of public employment and training programs show recidivism--they get placed in labor markets and then unplaced. These programs are de facto designed to equip their graduates for the bottom rungs of the ladder. However: bottom rungs are the most unstable; moving from them in today's economy requires more general human capital than these programs usually provide; and being unable to move from them undermines individuals' work ethic and perseverence in the labor market.

As table 6 showed, the bottom rung is a vulnerable rung--it is at perpetual risk of being sawed off, in the sense of being automated or organized out of existence. Human capital increasingly determines an individual's ability to move off the lowest rungs--and in today's economy, this mean having solid academic, problem-solving, and teamwork skills. Although discrimination, whether based on race, gender, ethnic status, or age, is still alive and well in labor markets, individuals are much less apt to get stuck in low rung jobs today for these reasons than because they lack the human capital to get out of them.

Bottom rung jobs are also the least attractive in the economy--they pay the least; often offer the fewest employee benefits, such as health care; they usually have the least pleasant working conditions. For some workers, the work ethic is a fixed personality trait; its intensity does not vary with the characteristics of employment. However, for the vast majority of workers, the work ethic waxes and wanes in response to the incentives associated with the job. Employers' attention to and investment in incentive systems, such as benefit packages, promotions, and wage increases, attest to this fact. Thus, being stuck in bottom rung jobs is not only a vulnerable place to be, but also a place that undermines commitment to the market. The labor market options for individuals who lack the human capital to leave these jobs become constrained to trading one bottom rung job for another or to not working at all.

If we are to stop the ominous evolution of a dual labor market, where human capital increasingly--and race and gender decreasingly--determines the occupational sorting of individuals, we have to confront at the post-secondary level the disadvantaged's lack of solid academic and problem-solving skills. This means rethinking the objectives of our public employment and training programs and the incentives that affect the behaviors of post-secondary institutions. This paper implies that both public employment and training programs and post-secondary occupational training programs need to focus more on developing stronger academic and problem-solving skills in their disadvantaged clients. This process may well be best conducted in conjunction with occupational training, but it almost certainly cannot be completed as quickly as giving an individual minimal preparation for a minimal market placement. Therefore, the time frame for client success also needs to be rethought.

We really have questions here more than policy recommendations.

First, do federal and state student grant and loan programs adequately cover the costs of postsecondary training for students from disadvantaged families? A few states already provide additional funds,[17] implying "holes" in current financing programs. Second, can current grant and loan programs be used to finance "remedial education"? Third, how might postsecondary institutions' eligibility for student grants and loans be tied to their record in remedial education? Fourth, how might institutions' records in equipping students with solid academic and problem-solving skills be publicized to inform disadvantaged students'

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[16] See Vaughan, op. cit.; Friedman, op. cit.; and Sar Levitan and Frank Gallo, *A Second Chance: Training for Jobs*, Kalamazoo, MI, W.E. Upjohn Institute, 1988.

[17] Michigan, for example, provides a scholarship for any low-income person who graduates from high school. See Friedman, op. cit., for a review of these state programs.

institutional choices? Fifth, what are the academic and problem-solving skill payoffs for this population of integrating remedial and occupational training?

## UNANSWERED QUESTIONS

Despite the importance of employer-sponsored training to individuals' and the nation's economic health, significant questions remain unanswered.

How should the complementarity of formal schooling and employer-sponsored training affect the design of school curricula?

How can curricula and teaching methods in high school respond more effectively to changes in the nature of work?

How can we most effectively tackle individuals' fundamental skill deficiencies at the post-secondary level?

What barriers must be overcome to increase the responsiveness of the public post-secondary education and training system to employers' and employees' training needs?

Are race and gender differences in the probability of receiving employer training narrowing?

What factors explain international variations in employers' investments in their workforces?

A number of questions can only be answered with better data on employer training investments, especially on training costs.[■]

Do small firms in fact invest less in training per employee than larger firms? How real are the apparent differences revealed by survey responses?

Who pays for employee training, and how and why does the employer-employee cost share vary?

What are the average and marginal rates of return to employer training? Are there systematic differences in rates of return by industry, by type of employee, and by type of employer (large versus small, for example)? What do these rates of return tell us about under-, over-, or mis-investment?

What is the distribution of employer-sponsored training between in-house and external school sources?

Who provides employer-sponsored training--for example, in-house trainers or post-secondary educators? If post-secondary educators provide the training, is it provided as a standard program offering, or is it customized to meet the needs of the particular employer?

What is the content of employer-sponsored training, and how does it seem to vary with different occupations and different regulatory, technological, company re-organization, or market events?

What are better ways to measure informal, on-the-job training?

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■ Mincer, "Labor Market Effects of Human Capital," op. cit., and Tan, op.cit., both discuss the nature of and problems with measures of employer-sponsored training in national surveys of individual workers. Ann Bartel, in "Utilizing Corporate Survey Data," op. cit., discusses results from, problems with, and the potential of surveys of *employers* to assess the levels and nature of, changes in, and determinants of their training investments.